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## ऐल्किड रेजिन के लिए विशिष्टि

( पहला पुनरीक्षण )

## Specification for Alkyd Resins

( First Revision )

ICS 87.060.20

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## FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Raw Materials for Paints, Varnishes and Related Products Sectional Committee had been approved by the Chemical Division Council.

This standard was first published in 1986. Alkyd resins are one of the important raw material used by paint industries. With indigenous production, growth in the usage and consequent demand for alkyds, “the need has been felt for the preparation of this standard.

Raw material for paint products may contain lead and other heavy and toxic metals either because of use as catalyst or their compounds being essential adjunct of formulation in manufacturing of paints. Taking cognizance of the fact that lead and toxic heavy metal exposure of human being, particularly children in residential premises is injurious to health and having adverse impact on human health and safety, the Committee responsible for formulation of this standard has felt the need to introduce restriction of lead and toxic heavy metal restriction in all paint raw material product standards. Revision of this standard has been taken up with a view to incorporate the maximum permissible limit of lead and heavy metal restriction clause in this standard. Therefore, in this revision, lead restriction up to a maximum permissible limit of 90 ppm and toxic heavy metals restriction (cumulative other than lead) as 0.1 percent maximum has been prescribed to avoid hazardous impact of lead and heavy metal exposure and consequent adverse impact on environment and human health. Further, majority of consumers are not aware of the consequences of lead and other heavy metal toxicity and its long-term implications to human health. Therefore, in this revision, along with lead and heavy metal restriction, a suitable cautionary notice has been included in the marking clause. The title of the standard has also been slightly modified for better understanding.

Besides above changes, the references of Indian Standards have been updated.

The composition of the technical committee responsible for formulation of this standard is given in Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (*revised*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

# Indian Standard

## SPECIFICATION FOR ALKYD RESINS

( First Revision )

### 1 SCOPE

This Indian Standard prescribes the requirements and methods of sampling and test for alkyd resins used in paint industry.

### 2 REFERENCES

The Indian Standards given below contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards:

| IS No                        | Title   |
|------------------------------|---|
| 1070 : 1992                  | Reagent grade water — Specification ( <i>third revision</i> )   |
| 1303 : 1983                  | Glossary of terms relating to paints ( <i>second revision</i> )   |
| 6667 : 1972                  | Glossary of terms used in synthetic resin industry  |
| 354<br>(Part 1) : 1987       | Method of sampling and test for resins for paints: Part 1 General test methods  |
| 354<br>(Part 2) : 1986       | Method of sampling and test for resins for paints: Part 2 Special test methods for alkyd resins   |
| 101<br>(Part 3/Sec 1) : 1986 | Methods of sampling and test for paints, varnishes, and related products: Part 3 tests on paint film formation, Section 1 Drying time ( <i>third revision</i> ) |
| 101<br>(Part 5/Sec 2) : 1988 | Methods of sampling and test for paints, varnishes, and related products: Part 5 Mechanical tests, Section 2 Flexibility and adhesion ( <i>third revision</i> ) |

### IS No

### Title

|                              |   |
|------------------------------|---|
| 101<br>(Part 4/Sec 4) : 2020 | Methods of sampling and test for paints, varnishes and related products: Part 4 Optical test, Section 4 Gloss — Determination of gloss value at 20°, 60° and 85° ( <i>fourth revision</i> ) |
| 101<br>(Part 8/Sec 5) : 1993 | Methods of sampling and test for paints, varnishes and related products: Part 8 Tests for pigments and other solids, Section 5 Lead restriction test ( <i>third revision</i> )              |

### 2 TERMINOLOGY

For the purpose of this standard, definitions given in IS 1303 and IS 6667 shall apply.

### 3 CLASSIFICATION OF ALKYD RESINS

**3.1** Alkyd resins are classified as follows:

**3.1.1** On the basis of fatty oil/acid content:

| <i>Types of Alkyds</i> | <i>Percentage of Fatty Acid</i> |
|------------------------|---------------------------------|
| Short oil alkyd        | Up to 40                        |
| Medium oil alkyd       | Above 40 and below 60           |
| Long oil alkyd         | 60 and above                    |

**3.1.1.1** The types of fatty oils/acids used shall be as follows:

| <i>Types of Fatty Oils/Acids</i> | <i>Iodine Value</i>    |
|----------------------------------|------------------------|
| Drying oil                       | 170 and above          |
| Semi-drying oil                  | From 110 and below 170 |
| Non-drying oil                   | below 110              |

**3.1.2** On the basis of modifying chemicals:

| <i>Types of Alkyd</i> | <i>Chemical Modifier</i>                  |
|-----------------------|---|
| Rosinated alkyd       | Wood/gum resin                            |
| Chain stopped alkyd   | Monobasic acids or monohydric alcohols    |
| Vinylated alkyd       | Vinyl acrylic or any unsaturated monomers |
| Phenolated alkyd      | Any phenol and any aldehyde               |
| Uralkyd               | Di-Isocyanates                            |
| Siliconised alkyd     | Silicones or silanes                      |
| Epoxy alkyd           | Epoxy compounds                           |

NOTES

**1** Manufacturer shall specify an approximate percentage of fatty oil, type of oil and type of modifier, if any, used.

**2** The percentage of any constituent shall be expressed as:

$$\frac{\text{The amount of constituent input}}{\text{Total input} - \text{Water of reaction}} \times 100$$

**4 REQUIREMENTS**

**4.1** Alkyd resins shall comply with the requirements specified in Table 1.

**4.2** For non-volatile matter and relative density, exact values have not been specified and only tolerance on declared values have been given. Absolute values will depend upon the type of oil used, method of synthesis adopted and the end use.

**4.3** Viscosity of alkyd resins when tested according to the method prescribed in IS 354 (Part 1), shall comply with the requirements given in Table 2 for that particular type.

**Table 1 Requirements for Alkyd Resins**  
( Clauses 4.1 and 4.4 )

| Sl No. | Characteristic  | Short oil Alkyd              | Medium oil Alkyd             | Long oil Alkyd               | Rosinated Alkyd                                      | Chain Stopped Alkyd          | Vinylated Alkyd              | Phenolated Alkyd             | Uralkyd Alkyd                | Siliconised Alkyd            | Epoxy Alkyd                  | Method of Test           |
|--------|---|------------------------------|------------------------------|------------------------------|--|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|--------------------------|
| (1)    | (2)   | (3)                          | (4)                          | (5)                          | (6)  | (7)                          | (8)                          | (9)                          | (10)                         | (11)                         | (12)                         | (13)                     |
| i)     | Colour (on Gardner Scale), Max (see Note 1)   | 8                            | 10                           | 10                           | 12   | 12                           | 12                           | 12                           | 12                           | 12                           | 12                           | IS 354 Part 1            |
| ii)    | Non-volatile matter, percent by mass  | ± 1 on the declared value    | ± 1 on the declared value    | ± 1 on the declared value    | ± 1 on the declared value                            | ± 1 on the declared value    | ± 1 on the declared value    | ± 1 on the declared value    | ± 1 on the declared value    | ± 1 on the declared value    | ± 1 on the declared value    | IS 354 Part 1            |
| iii)   | Acid value (see Note 2)   | 15–30                        | 5–20                         | 5–10                         | 30 Max   | 10 Max                       | 10 Max                       | 30 Max                       | 10 Max                       | 10 Max                       | 10 Max                       | IS 354 Part 1            |
| iv)    | Hydroxyl value  | 100–150                      | 70–90                        | 50–70                        | As agreed between the manufacturer and the purchaser |                              |                              |                              |                              |                              |                              |                          |
| v)     | Relative density at 27/27 °C  | ± 0.02 on the declared value | ± 0.02 on the declared value | ± 0.02 on the declared value | ± 0.02 on the declared value                         | ± 0.02 on the declared value | ± 0.02 on the declared value | ± 0.02 on the declared value | ± 0.02 on the declared value | ± 0.02 on the declared value | ± 0.02 on the declared value | IS 354 Part 1            |
| vi)    | Fineness on Hegmann gauge, microns, Max   | 13                           | 13                           | 13                           | 13   | 13                           | 13                           | 13                           | 13                           | 13                           | 13                           | IS 354 Part 1            |
| vii)   | Drying time, hour   |                              |                              |                              |  |                              |                              |                              |                              |                              |                              |                          |
|        | (i) Surface dry   | 2 Max                        | 2 Max                        | 3 Max                        | 2 Max  | 3/4 Max                      | 1/4Max                       | 1 Max                        | 1Max                         | 1Max                         | 1 Max                        | IS 101<br>(Part 3/Sec 1) |
|        | (ii) Hard dry   | 8 Max                        | 8Max                         | 10 Max                       | 10 Max   | 8 Max                        | 3/4 Min                      | 8 Max                        | 5 Max                        | 8 Max                        | 8 Max                        |                          |
|        | (iii) tack free   | 24 Max                       | 24 Max                       | 24 Max                       | 24 Max   | 24 Max                       | 5 Max                        | 24 Max                       | 24 Max                       | 24 Max                       | 24 Max                       |                          |
| viii)  | Scratch hardness of film (thickness not exceeding 25 microns) after 48 hours of drying, gram, Min (see Note 3)    | –                            | 1000                         | 800                          | 1000   | 1200                         | 1200                         | 1000                         | 1000                         | 1000                         | 1000                         | IS 101<br>(Part 5/Sec 2) |
| ix)    | Scratch hardness of stoved (film thickness not exceeding 25 microns), Min (see Note 4)                            | 1200                         | –                            | –                            | –  | –                            | –                            | –                            | –                            | –                            | –                            | IS 101<br>(Part 5/Sec 2) |
| x)     | Gloss of staved film (thickness not exceeding 25 microns) at 120 °C for 30 minutes and 150 °C for 12 minutes, Max | Glossy hard film             | –                            | –                            | Glossyhard film                                      | Glossyhard film              | Glossy hard film             | Glossy hard film             | Glossyhard film              | Glossy hard film             | Glossy hard film             | IS 101<br>(Part 4/Sec 4) |

Table 1 (Concluded)

| Sl No.   | Characteristic                 | Short oil Alkyd | Medium oil Alkyd | Long oil Alkyd | Rosinated Alkyd | Chain Stopped Alkyd | Vinylated Alkyd | Phenolated Alkyd | Uralkyd Alkyd | Siliconised Alkyd | Epoxy Alkyd | Method of Test |
|--|--------------------------------|-----------------|------------------|----------------|-----------------|---------------------|-----------------|------------------|---------------|-------------------|-------------|----------------|
| (1)  | (2)                            | (3)             | (4)              | (5)            | (6)             | (7)                 | (8)             | (9)              | (10)          | (11)              | (12)        | (13)           |
| xi)  | Tolerance to solvent           |                 |                  |                |                 |                     |                 |                  |               |                   |             | IS 354 Part 2  |
|  | <i>Mineral Turpentine, Min</i> | –               | 1:50             | 1:50           | 1:10            | –                   | –               | –                | –             | –                 | 1:10        |                |
|  | <i>Xylene, Min</i>             | 1:50            | 1:50             | 1:50           | 1:50            | 1:50                | 1:50            | 1:50             | 1:50          | 1:50              | 1:50        |                |
| xii)   | Freedom from resin             | Free            | Free             | Free           | Free            | Free                | Free            | Free             | Free          | Free              | Free        | IS 354 Part 2  |
| NOTES  |                                |                 |                  |                |                 |                     |                 |                  |               |                   |             |                |
| 1 Unless otherwise agreed to between the manufacturer and the purchaser, the colour shall be determined at 50 percent solution mass/volume in appropriate solvent. |                                |                 |                  |                |                 |                     |                 |                  |               |                   |             |                |
| 2 Acid value shall be calculated on the basis of non-volatile matter of the resin solution.  |                                |                 |                  |                |                 |                     |                 |                  |               |                   |             |                |
| 3 This Test is applicable for drying and semi-drying oil alkyd resins only.  |                                |                 |                  |                |                 |                     |                 |                  |               |                   |             |                |
| 4 This test is applicable for non-drying oil alkyd resin.  |                                |                 |                  |                |                 |                     |                 |                  |               |                   |             |                |
| 5 Actual value of drying and quantum of dryers/cross linkers/solvents to be added are to be agreed upon between the manufacturer and the purchaser.                |                                |                 |                  |                |                 |                     |                 |                  |               |                   |             |                |

**Table 2 Viscosities at 30±0.5 °C of Alkyd Resins Solution**  
( Clause 4.3 )

| Sl No. | Types of Alepd      | Diluant/Percent Non-Volatile | Unit              | High Viscosity    | Medium Viscosity    | Low Viscosity      |
|--------|---------------------|------------------------------|-------------------|-------------------|---------------------|--------------------|
| i)     | Short oil alkyd     | Xylene/50                    | Stokes<br>Seconds | 10-12<br>—        | 5-8<br>—            | 3-4<br>100-131     |
| ii)    | Medium oil alkyd    | Mineral turpentine/50        | Stokes<br>Seconds | 10-12<br>—        | 7-8<br>—            | 3-4<br>100-131     |
| iii)   | Long oil alkyd      | Mineral turpentine/50        | Stokes<br>Seconds | 3.3-4.7<br>130±10 | 2.60-3.10<br>100±10 | 1.4-2.15<br>60±10  |
| iv)    | Rosinated alkyd     | Mineral turpentine/40        | Stokes<br>Seconds | 10-14<br>—        | 5.0-8.0<br>6        | 4.0-5.0<br>140±10  |
| v)     | Chain stopped alkyd | Xylene/50                    | Stokes<br>Seconds | —<br>—            | 3.0-5.0<br>100-150  | 2.0-3.0<br>80±20   |
| vi)    | Vinylated alkyd     | a) Xylene/ 50                | Stokes<br>Seconds | 5.0-6.0<br>—      | 3.0-5.0<br>100-150  | 2.0-3.0<br>80±20   |
|        |                     | b) Aromax/50                 |                   | 10-15<br>—        | 6.0-9.0<br>—        | 3.0-5.0<br>100-150 |
|        |                     |                              |                   |                   |                     |                    |
| vii)   | Phenolated alkyd    | Xylene/50                    | Stokes<br>Seconds | —<br>—            | —<br>—              | 1.4-2.15<br>60±10  |
|        |                     |                              |                   |                   |                     |                    |
| viii)  | Uralkyd             | Xylene/50                    | Stokes<br>Seconds | —<br>—            | 3.0-5.0<br>120±20   | 1.4-25<br>60±10    |
|        |                     |                              |                   |                   |                     |                    |
| ix)    | Siliconised alkyd   | Xylene/50                    | Stokes<br>Seconds | —<br>—            | 3.0-5.0<br>120±20   | 1.4-2.15<br>60±10  |
|        |                     |                              |                   |                   |                     |                    |
| x)     | Epoxy alkyd         | Xylene/50                    | Stokes<br>Seconds | 10-14<br>—        | 5.0-8.0<br>—        | 4.0-5.0<br>130±10  |
|        |                     |                              |                   |                   |                     |                    |

#### NOTES

**1** The manufacturer shall specify the solvent to be used as diluant. If not declared by the manufacturer, the one specified against each type of alkyd under column 3 shall be used.

**2** Flow cup No. 4 method shall be used, in case the viscosity is above 150 s, use alternate methods.

**3** Bubble tube method and flow cup No. 4 method provide values in seconds. Values obtained by using bubble tube method are convertible to stokes by multiplying with a factor for the viscometer given in its calibration certificate. Correct size of Oswald --- tube viscometer shall be selected depending upon viscosity value.

**4** Stokes = 100 centistokes and poise = stokes × relative density.

#### 4.4 Keeping Quality

The material when stored in normal storage conditions shall retain its property for at least 12 months from the date of manufacture as prescribed in Tables 1.

#### 4.5 Lead Restriction

The material shall be tested for restriction from lead in accordance with IS 101 (Part 8/Sec 5), or by Atomic Absorption Spectrometer (AAS) or by ICP. When thus tested the material shall not contain lead or compounds of lead or mixtures of both, calculated as metallic lead exceeding 90 ppm (*see* Note).

NOTE — When no lead is used during production (lead free).

#### 4.6 Toxic Heavy Metal Restriction

Product shall not be manufactured using mercury and mercury compounds, cadmium, chromium VI, arsenic, antimony, and their oxides. The material shall

not contain more than 0.1 percent by weight in total of above toxic heavy metals in the form of natural impurities or impurities entailed by the production process which are contained in the raw material, when tested by the relevant Atomic Absorption Spectroscopic methods or by ICP method.

#### 5 FORM OF SUPPLY

Alkyd resins shall be supplied as 100 percent solids or any other percentage solution in any suitable solvent as agreed to between the manufacturer and the purchaser.

#### 6 PACKING AND MARKING

##### 6.1 Packing

The material shall be packed in sound, clean and dry containers as agreed to between the manufacturer and the purchaser.

## 6.2 Marking

**6.2.1** Each Container shall be marked with the following:

- a) Name and type of the material;
- b) Mass of the material;
- c) Type of fatty acid used;
- d) Lead content (maximum);
- e) Toxic heavy metals content;
- f) Month and year of manufacture;
- g) Batch No. or Lot No. in code or otherwise; and
- h) Name of the manufacturer and/or his recognized trade-mark, if any.
- j) Cautionary note as below:
  - 1) Keep out of reach of children; or
  - 2) This product may be harmful if swallowed or inhaled.

### 6.2.2 BIS Standard Mark

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act, 2016* and the Rules and Regulations framed there under, and the products may be marked with the Standard Mark.

## 7 QUALITY OF REAGENTS

Unless specified otherwise, pure chemicals and distilled water (*see* IS 1070) shall be used.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

## 8 SAMPLING

Representative samples of the material shall be drawn as prescribed under IS 354 (Part 1).



**ANNEX A***( Foreword )***COMMITTEE COMPOSITION**

Raw Materials for Paints, Varnishes and Related Products Sectional Committee, CHD 21

| <i>Organization</i>   | <i>Representative(s)</i>   |
|---|--|
| In personal capacity (Retired from IIT Bombay)              | PROF A. S. KHANNA  |
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| <i>Organization</i>                       | <i>Representative(s)</i>  |
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Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards: Monthly Additions'.

This Indian Standard has been developed from Doc No.: CHD 21 (16981).

### Amendments Issued Since Publication

| Amend No. | Date of Issue | Text Affected |
|-----------|---------------|---------------|
|           |               |               |
|           |               |               |
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Published by BIS, New Delhi